



Engaging or Transmitting?

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Engaging or transmitting?

Health at the science centre

CATHARINA THIEL SANDHOLDT & MARIANNE ACHIAM

Abstract: *Science centres have a strong commitment to education, but the implications of that commitment change over time. The discovery pedagogy of the first science centres is gradually being replaced with a more dialogic approach that acknowledges that science has different meanings for different people. Here, we follow the transition of a Danish science centre towards this new approach; a transition driven by the development of a dialogic exhibition on health. To this end, we study the adaptive transformation of scientific content from its origin in scientific literature to its embodiment in the exhibition, using discourse analysis to track its deconstruction and reconstruction. We observe that although the science centre's established discovery pedagogy does challenge the implementation of dialogic perspectives on health, the participatory approach taken in the development process successfully overcame these challenges. In conclusion, we offer our perspectives on the implications of our findings for science centres.*

Keywords: Didactic transposition, exhibition development, health promotion, science centre, participatory design.

When the Apollo mission provided humanity with the very first images of the Earth seen from space, a new awareness was raised of the interconnectedness of humans with natural systems. This awareness influenced a range of societal institutions, not least science centres and museums, whose on-going quest for external meaningfulness thus entered into a new phase (Koster 2016). For museums, this renewal of purpose was manifested in a shift of institutional focus away from their traditional and internally-oriented activities such as collecting and preserving objects towards externally-oriented activities such as

using those collections to create scientifically informed and democratically empowered citizens (Black 2012; Koster 2016).

Unlike museums, science centres originated in the Apollo era. Due to the social and political conditions of that time, science centres from the outset had a strong focus on providing citizens with access to knowledge about science and technology (Ogawa *et al.* 2009). In the 1960s, this meant offering the public opportunities to become familiar with science through laboratory apparatus (Oppenheimer 1968); this *discovery pedagogy* still persists in many science centres. However, as the

prevailing post-positivist paradigm in science education in the 1980s was gradually replaced with more contextual and critical perspectives (Anderson & Ellenbogen 2012; Treagust *et al.* 2014), forward-looking science centres adjusted their institutional pedagogies as well. Today, many science centres acknowledge the range of backgrounds, experiences, and understandings their visitors bring. Further, it is becoming clear that the positivist and post-positivist notions of science as universally true, context-free, and unequivocal are a poor fit for this diversity. Accordingly, the most progressive science centres question authoritative, canonical science and seek instead to engage their communities in dialogue to negotiate what science means for them (Bandelli & Konijn 2013; Dawson 2014). However, not all science centres have made these changes. For many, “dialogue” is synonymous with the action-response capabilities of their interactive exhibits on canonical science (Quistgaard & Kahr-Højland 2010; Amodio 2013; Koster 2016).

The context of the present study is a Danish science centre, which, when the data was collected, was in the process of changing its institutional paradigm. Up to this point, the science centre had employed a post-positivist view of science that manifested itself in the exhibitions in the form of “representations of science [...] that are monolithic, objective and apolitical, even though often in an interactive, hands-on environment” (Pedretti 2002:7; see fig. 1). However, there was a consensus that a change was required, and it was decided that this change was to be spearheaded by the research-guided development of an exhibition: A process that could at the same time serve to model new contextualised, dialogic and participatory ways of working in the science centre. Here, we investigate how the science centre afforded new ways of creating meaning-



Fig. 1. The Heartbeat Fountain, an exhibit that is part of the exhibition Beneath the Skin at the science centre Experimentarium. When visitors grip the handles, their heartbeat controls the spurts of the artificial heart inside the acrylic tube. The central label reads “1. Grip the two handles (electrodes). 2. Be patient – it takes a few seconds for your pulse to take control of the fountain”. A smaller label to the left reads “Did you know that for every heartbeat, the heart does enough work to lift one decilitre of blood 1.2 metres into the air! The blood pressure is the force, that pushes the blood around the body’s circulatory system”. Photo Catharina T. Sandholdt, 2017.

ful and contextual participatory experiences for visitors, but also how traditional, entrenched institutional logics challenged these attempts. But before we explain our theoretical framework, a few remarks on the scientific subject of the exhibition – human health – are required.

THE SUBJECT OF HEALTH IN A SCIENCE CENTRE

Within science communication there is an increasing interest in health (Zeyer & Dillon 2014), as sedentary behaviour, unhealthy food and addictive substances such as alcohol and cigarettes that are commonplace today

138 contribute to creating populations with bad health, chronic diseases and short life expectancy (Statens Institut for Folkesundhed 2009). Health is a complex issue, transcending public debate and policy making as well as personal everyday practises. For these reasons, the potential of museums and science centres to enrich public understanding about human health through dialogue has been discussed (Camic & Chatterjee 2013). So far, however, little research has been conducted on how health is communicated in museum and science centre settings, or how visitors respond to health messages during a museum or science centre visit (Christensen *et al.* 2016).

In Western countries, public health research focuses on issues of nutrition, smoking, alcohol consumption and physical activity. In Denmark, this focus is summarised in the acronym KRAM¹ (Statens Institut for Folkesundhed 2009; Eriksen *et al.* 2011), which has influenced Danish policy work on health. Findings from medical research have been operationalised into what we might call the KRAM model of “good practise behaviours” related to nutrition, smoking, alcohol consumption and physical activity such as the recommendation that every adult should be active at least 30 minutes a day (Pedersen & Andersen 2011). Recently, the unilateral focus of the KRAM model has been problematized by scholars from the social sciences (U. Jensen & Andersen 1994). One line of critique points out that the practices of everyday life – for instance food practices – are more tightly bound to culture and values than to rational arguments from the natural and medical sciences (Halkier & I. Jensen 2011). This means that simply informing the public about health and recommendations for good behaviour is insufficient to change their (un)health(y) practises in everyday life. Another perspective

critiques the “good practise behaviours” for being paternalistic and moralizing (Elsass 1994). Collectively, researchers call for more research and communication of health founded in dialogue and context-based approaches (Carlsson *et al.* 2009).

In response to this call, progressive health-promotional research seeks to unfold new aspects of health and operate with broader definitions and perspectives based on traditions and methods from the humanities (B. Jensen 2004; Kamper-Jørgensen *et al.* 2009; Thorgaard & U. Jensen 2011). This approach is in accordance with the World Health Organization (WHO) definition of health as being “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (World Health Organization 2014).

In conclusion, we observe that the tension between the traditional, authoritative way of communicating health and the more context-sensitive approach from health promotion theory corresponds well with the paradigm shift that many science centres are facing. The research question for the present study is thus: How do the pre-existing institutional logics of a science centre facilitate and obstruct the development of an exhibition on human health rooted in a dialogic and contextual approach? In the following section, we outline the theoretical framing we used to investigate this question.

INVESTIGATING THE PROCESS OF EXHIBITION DEVELOPMENT

The scientific content that is embodied in science centre exhibitions usually originates elsewhere. To create science exhibitions that are apprehendable and engaging to visitors, exhibition development professionals must

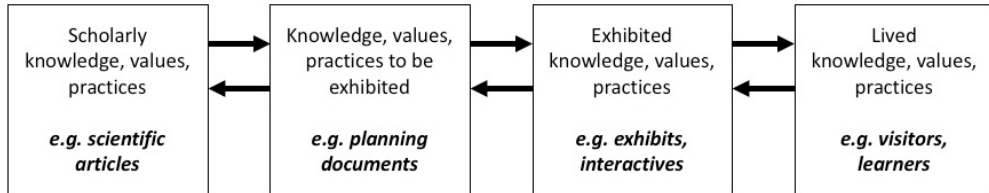


Fig. 2. The steps of didactic transposition of scientific content in the development and subsequent experience of a science exhibition (modified from Mortensen 2010).

therefore *select* scientific content produced by scientists and other scholars, and subsequently *transform* that scientific content into physical installations and environments that can be experienced by visitors (Achiam & Marandino 2014). This process of selection and transformation of science to create science exhibitions is described as *didactic transposition* (Mortensen 2010), literally referring to the transformation and translocation of scientific content in order to make it apprehendable by the intended learners (fig. 2).

Although the diagram depicted in fig. 2 may give the impression that science exhibitions are the product of a top-down, unidirectional flow of information, the theory of didactic transposition acknowledges the interaction of knowledge, values and practices between the institutions involved in the transposition process (Quessada & Clément 2007; Chevallard & Bosch 2014) as indicated by the bidirectional arrows in fig. 2. For instance, when exhibit design is influenced by observations of visitors' interactions with exhibit prototypes, there is an influence from right to left in the diagram.

In summary, the didactic transposition framework sees the development of science exhibitions as the interaction between knowledge, values and practices residing in different institutions and expressed in different modalities. Content is thus never static nor objective, but negotiable and always adapted to

fit the given context. This again means that in order to evaluate a science exhibition in terms of its educational legitimacy, cultural value or social relevance, it is necessary to consider the various contexts and steps involved in the didactic transposition (Chevallard & Bosch 2014; Achiam *et al.* 2016).

In the present text, we use the framework of didactic transposition to investigate how content related to human health is transformed and translocated from its origins to a science centre exhibition. Because we are interested in how the institution of the science centre conditions and constrains this process, we consider only the two first steps of the transposition (Mortensen 2010). In the present case, the scholarly knowledge, values and practices involved in the didactic transposition includes both the established KRAM model (Statens Institut for Folkesundhed 2009) and the more progressive health promotional theory (B. Jensen 2009). The knowledge, values and practices to be exhibited are those that are described in the planning documents of the exhibition. Finally, the exhibited knowledge, values and practices are those that are manifested in the final exhibition in the form of physical installations, texts, objects, and images (fig. 3). In the following section, we describe how we identify the knowledge, values and practices in each step of the transposition.

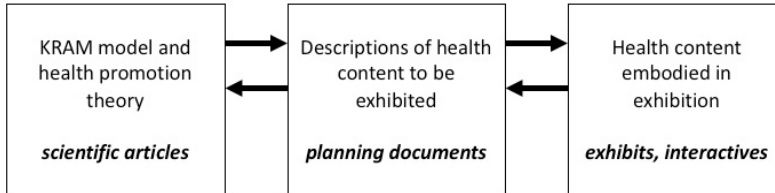


Fig. 3. We investigate the first two steps of didactic transposition in the development of a science centre exhibition on human health.

IDENTIFYING HEALTH-RELATED KNOWLEDGE, VALUES AND PRACTICES

As is evident from the preceding discussions, the didactic transposition of content involves a number of transformations of that content, both with respect to complexity and with respect to modality. We thus require a means of analysis that can transcend modality in order to recognise and identify health-related knowledge, values and practices across the exhibition development process. To this end, we employ discourse analysis as a way of identifying coherent units of health-related language, whether written, spoken, visualised, or embodied in three-dimensional exhibits (Meng 2004). Because we are interested in the tension between authoritative and dialogic approaches to exhibiting scientific content, we pay particular attention to the presence of authoritative and dialogic discourse in each step of the transposition.

Scott *et al.* (2006) describe how classroom-based teaching can be evaluated along two spectrums, namely from non-interactive to interactive and from authoritative to dialogic. When these authors refer to the non-interactive/interactive spectrum, they denote the degree to which the educator involves learners in spoken exchanges. In contrast, when they refer to the authoritative/dialogic spectrum, Scott *et al.* (2006) describe whether

the scientific discourse in the classroom is restricted to established, canonical science or it allows for, and values, different accounts of science. We employ this latter distinction to assess the status of the discourse on health as authoritative or dialogic in each step of the transposition. We consider the plurality of voices, whose discourses are being presented, and whether a passive voice is being used. Examples are provided in the following sections.

THE SCIENCE CENTRE AND THE EXHIBITION

The present study focuses on the Danish science centre *Experimentarium*. It investigates the four-year long (2012–2015) development process of the exhibition *PULSE Plaza*² on human health. The exhibition team consisted of four developers and four researchers (one of whom is the first author of the present paper).

From the outset, it was a clear objective that the development of *PULSE Plaza* should serve as a model for new dialogic and participatory ways of working at *Experimentarium*. The development process was initiated by a phase of research on the subject of health and health promotion. The subsequent steps of the process were based on a high degree of user involvement, involving a research-driven

ethnographic field study among families who were the target demographic for the exhibition (Reeve & Bell 2009). The findings from this field study were used in a co-design process with a selection of families, based on participatory design methods (Simonsen & Robertson 2012; Sandholdt & Ulriksen 2018), resulting in the final exhibition.

As mentioned, we analyse the transposition of health-related knowledge, values and practices here through discourse analysis of the scientific publications that fed into the development process, the collection of planning briefs that documented the development process, and finally, of the actual exhibition (see fig. 3). The planning briefs include the original funding application for the exhibition project (Experimentarium & Steno Diabetes Centre 2012), and three internal exhibition design reports (Experimentarium 2013, 2014a, 2014b). The funding application is originally written in English, while the three internal exhibition design reports are originally in Danish; the quotes used here are translated by the authors.

SCHOLARLY KNOWLEDGE, VALUES AND PRACTICES

The scientific content that was considered in the PULSE project was research literature relating to the KRAM framework (Statens Institut for Folkesundhed 2009) as well as research literature reflecting a broad conception of health in concurrence with health promotional theory (Jensen 2009). We have already outlined these two positions and the tensions between them; here we give examples of the discourses present in these documents. The following excerpt represents a set of recommendations for physical activity for adults (Pedersen & Andersen 2011:12):

Be physically active at least 30 minutes a day. [...] At least twice a week, high-intensity physical activity of at least 20 minutes' duration should be included in order to maintain or improve condition and strength. Activities that improve bone strength and mobility should be included. Physical activity beyond these recommendations will provide further health benefits.

In this excerpt, we observe how a single, passive voice transmits an authoritative missive on the connection between health and physical activity. There are no alternative viewpoints represented, no consideration of the reader's circumstances, and the tone is dispassionate and factual. We find the excerpt to clearly represent an authoritative discourse.

In contrast, an example of a dialogic discourse is provided by the Danish SOL³ project (Foxvig *et al.* 2016). In the SOL project health professionals, municipal actors, local vendors and local media formed a collaboration to promote healthy actions and behaviours in the selected community. One initiative, *Taste and Senses*, focused on educating children about healthy eating habits. Already in the title, a more holistic approach to health is apparent. The report further describes how children naturally prefer sweet tastes, and thus need to slowly get accustomed to other flavours:

Through fun games and positive experiences with food, the SOL project worked to develop children's taste experiences and their ability to express what they tasted, sensed and experienced (Foxvig *et al.* 2016:27)

In this excerpt, as well as in the SOL report proper, there is no single, authoritative voice on what constitutes health. Rather, a holistic approach is taken that emphasises a diversity

142 of experiences concerning health, and allows for different ways of negotiating healthy eating.

KNOWLEDGE, VALUES AND PRACTICES TO BE EXHIBITED

The content to be exhibited was described in the collection of planning briefs for the exhibition. These included the original funding application (Experimentarium & Steno Diabetes Centre 2012) as well as three design reports (Experimentarium 2013, 2014a, 2014b), which are analysed in the following. We shall refer to these documents as “the Application” and “Design Report 1” through “Design Report 3”.

Because the PULSE project aimed to create a dialogic exhibition, it is not surprising that the Application draws strongly on progressive health promotion research. For instance, on page 12, the Application states “The overall purpose of the [...] project is to develop innovative health promotion activities that include a science museum exhibition as a key setting”. Further, it describes how the exhibition project “will break new ground and seek alternative solutions not only to address well known risk factors, but also to improve closely related factors such as wellbeing and quality of life” (page 10). This statement acknowledges a diversity of ways of achieving wellbeing.

Further evidence of the Application’s adherence to progressive health promotion research is offered in its formulation of four educational principles on page 6: 1. Participation and action competences, 2. A broad and positive perception of health, 3. Multiple approaches for multiple settings and 4. Equity in health, reaching new target groups. These educational principles are derived directly from core principles in health education (Grabowski *et al.* 2017). The terms “participation”, “broad”, and “multiple” in

particular seem to give voice to a diversity of viewpoints, while the term “equity” explicitly puts the intended visitors on an equal footing with exhibition developers. Finally, the Application identifies families as the target group of the exhibition, acknowledging the importance of social interactions during science centre experiences (Gutwill & Allen 2010).

Even though the Application clearly acknowledges a plurality of voices and advocates a progressive, dialogic approach to health education, we still found underlying references to more authoritative perspectives. For instance, on page 15, the Application invokes a traditional conception of the body as a machine: “To stimulate dialogue and support social activities on physical activity and health, the exhibition’s preliminary focus is on the body’s engine: the heart”. This mechanistic way of describing the body is consistent with the traditional authoritative discourse in science centres. Further, in spite of the Application’s stated ambition of creating shared experiences, the exhibit designs are targeted towards individual users, for example on page 16. Here, an exhibit idea is described in terms of activity and relaxation zones that “allow visitors to learn more about their pulse and physical activity on an individual basis.”

To recapitulate: The PULSE Application contains several instances of the authoritative discourse from traditional science centre practices that exist in tension with the overarching dialogic discourse that reflects notions from progressive health promotion. While traditional science centre exhibitions are typically based on exhibits designed for individuals, progressive health-promotional interventions are generally planned around groups or involve network-building. Further, science centres have

traditionally communicated knowledge of the physical body through for instance anatomical facts and mechanistic ideas (Christensen *et al.* 2016), whereas health promotion calls for broader and more negotiated perceptions of health.

We proceed now to analysing the three Design Reports. These reports were authored during the exhibition development phase, and thus document how the tension between the authoritative and dialogic discourse was in some cases resolved, in some cases not, by the exhibition team.

Design Report 1 was written just before the findings from the ethnographic field work among families were shared with the exhibition team. Entitled *Remember your body*, it emphasises physical activity as a goal for the exhibition: “The human body is made for movement, but are you and your family active enough in everyday life?” (page 5). It consists of loosely structured ideas for exhibit activities.

In Design Report 1, the approach to health promotion largely reflected the KRAM framework. One exhibit idea draws on the KRAM recommendation of a certain amount of physical activity for adults: An exhibit is described where visitors enter a small room with a video playing of a family. The on-screen family shares the same pulse; this is communicated to the prospective visitors through a heartbeat sound and a diagram on the video screen. When the on-screen family members are sedentary instead of being active together, the sound of the heart decreases in rhythm until the pulse is lost. Design Report 1 describes how, at this point, a narrator explains how we are too inactive in our everyday lives and that action is needed. The PULSE Plaza exhibition is then pointed out as the place for action, and the prospective visitors are prompted to find and activate the missing

family pulse (page 31). The treasure hunt narrative described in this exhibition idea clearly draws on the traditional authoritative discourse within science centres. In this logic, if the pulse is found, the family has solved the task correctly. This “correct answer” seems to indicate a traditional conception of a direct, causal relationship between becoming aware of a health issue and acting on it (McLeary & Toon 2012).

Design Report 1 sketches another exhibit idea, this one intended to contribute to the prospective visitors’ search for the lost pulse mentioned above. *The Journal of Daily Movement* asks the prospective visitors: “How active are you in everyday life?” (page 22). The prospective visitors can view a scaled-up journal that follows the official recommendations for physical activity. They then choose pieces symbolising different kinds of activities and create their individual journals. The intention is for these journals to exceed the amount of physical activity present in visitors’ current everyday life. The primary goal of the activity is described in Design Report 1 as promoting “dialogue and consciousness on the kinds of movement performed in the family. A discussion of what you want to do – sorting and prioritising is necessary since there is not enough time to achieve it all” (page 23). Even though the aim of the *Journal of Daily Movement* is ostensibly dialogue, it is difficult to imagine how the prompted conversation can go beyond what Scott *et al.* (2006) describe as interaction. The dominant voice in the exhibit sketch is authoritative and centred on pre-determined and non-negotiable recommendations from the KRAM framework.

Another exhibit idea in Design Report 1 suggests that visitors be prompted to expose each other’s unhealthy behaviour, i.e.: “How

144 much time does (name of visitor) spend in front of the television every day?” (page 13). The subsequent questions are directed at the habits and behaviours of individual family members; they are formulated in terms of risks and possible dangers connected with (un)health(y) behaviour, much in line with health communication from traditional health research. One dominant, authoritative voice is present, and there seem to be no legitimate alternatives.

Design Report 2 presents a carefully prepared overview of the prospective exhibition, with an exhibition narrative and key exhibit ideas. It reflects the considerable development work that was carried out after the ethnographic field work and participatory co-design process with families. These processes unfolded how the involved families perceived health, and clarified the extent to which families were aware of official recommendations about daily physical activity. Further, the involvement of families uncovered the collective dynamics and social practices of everyday family life, where clashing practices, tasks and distributions of roles made it difficult to live up to these recommendations (see Bønnelycke *et al.* 2018b).

The overarching approach to health in Design Report 2 is markedly different from that of Design Report 1. This is clear already in the title: From Design Report 1: *Remember Your Body* to Design Report 2: *Eeny, miny, PULSE oh blimey*.⁴ This shift illustrates the exhibition team's discussions on how to engage prospective visitors in physical activity through a progressive health promotion perspective; discussions that resulted in a much more positive approach with quirky representations of everyday life. For instance, Design Report 2 acknowledges an incident in which one of the participating mothers had

reacted negatively to direct inquiries into the movement practices of her family, because she found it inappropriate to be confronted with her own busy everyday life on an otherwise positive visit to the science centre. Experiences like these prompted reflection in the exhibition team, who write “We as developers learned/ experienced [...] how narrow a path one has to walk in conversations about family health behaviour” (page 37). As a result of this growing realisation, the previously described exhibit idea in which the on-screen family slowly slid into sedentary behaviour was abandoned. Instead the main message and communicative aim of the exhibition became:

Even in a busy family life, many joyful options exist for getting your pulse to rise and moving together. The communicative aim of the exhibition is to stimulate and support dialogue on movement and health within the family and provide a positive, entertaining and inspiring shared experience with a focus on movement (page 4).

In descriptions of several prospective exhibits, Design Report 2 focuses on asking questions rather than seeking to transmit “correct” answers. Instead of the previous focus on nominating individual health behaviour, many exhibits are formulated as quizzes with multiple-choice answers. In other words, the activities focus on creating shared family experiences rather than prompting competition between individuals. Accordingly, we consider Design Report 2 to have a much stronger foundation in progressive health promotion theory than Design Report 1. A plurality of voices are heard, and a range of different viewpoints on health and movement are acknowledged (“many joyful options exist”).

In Design Report 3, many of the notions from



Fig. 4. The exhibit the Balance Kitchen, part of the PULSE Plaza. Photo Experimentarium, 2017.

progressive health promotion theory come to final fruition. The notion of participation is represented in the described requirement of visitors to form teams and check-in to the prospective exhibition *together* in order to activate the exhibits; in fact, the prospective exhibition cannot be used by individuals. A number of multi-user exhibits are described, including a photo booth function where visiting families are photographed together, in action. The intent of this photo booth is for families to capture the memory of all its members having a great time while being physically active. They can “choose among the funny pictures taken while the family went physically *all in* in the activity [and] attach the best picture to their own unique collection of experiences and ideas [for movement]” (page 11). Furthermore, Design Report 3 fully incorporates a broad and positive health

concept by utilising a whimsical scenography based on families’ everyday universe. Gone is the authoritative discourse on “correct” ways of being healthy; instead, prospective visitors are invited to share their views and practices on everyday movement with one another and with the interactive features of the exhibits.

In summary, the three Design Reports document the deconstruction and reconstruction of health-related knowledge, values, and practises in the development of the PULSE Plaza exhibition. Design Report 1 employed a decidedly authoritative discourse with individual-oriented activities and non-negotiable messages of how visitors *ought* to behave. This discourse is gradually replaced with a dialogic discourse in Design Reports 2 and 3, where the influence of the field work and co-design processes is apparent. These latter Reports emphasise the family as a collective,



Fig. 5. The exhibit the Dancing Bathroom, part of the PULSE Plaza. Photo Experimentarium, 2017.

sketch multi-user exhibits, and suggest a fun and informal scenography based on movement in the everyday. They describe the aim for the prospective exhibition as creating family experiences with health through entertaining body-on exhibits, prompting actions and reflections that transcends the visit and affect everyday health practise and promote body-awareness, thereby mobilising action competences grounded in the family collective.

EXHIBITED KNOWLEDGE, VALUES AND PRACTICES

The final PULSE Plaza exhibition milieu consists of a 600 m² exhibition designed with a whimsical daily-life narrative, where each exhibit resembles something familiar from everyday life (for instance the *Balance Kitchen* and the *Obstacle Hallway*). PULSE consists of eight primary exhibits and a midpoint area.

To engage in the exhibition the prospective visitors must form teams of 2–5 participants and register. All exhibits are designed for multiple users, engaging the whole team physically. Using screens in the midpoint area, the prospective teams can take fun-fact quizzes on health with multiple-choice answers. They can see photos of themselves taken during their engagement in the exhibits, and nominate the different exhibits for being “most fun”, “having the greatest learning potential” and “most adaptable to my daily life”. The software is designed so that all information entered by visitors is sent to them afterwards by e-mail.

The PULSE exhibition embodies a dialogic discourse on health. One example is provided by the exhibit the *Balance Kitchen* (fig. 4), where balance skills are in focus. The exhibit is designed to resemble a kitchen environment, and the task for the prospective visitors is to turn off as many as possible of the lit buttons

on the walls for two minutes without touching the floor. Visitors must cling to the walls, jump from pot to pan, and walk the line on a giant kitchen rolling pin. Another example is offered by the exhibit the *Dancing Bathroom* (fig. 5), which focuses on coordination. A video instructor models dance moves for the participants to follow in real time, and the dance moves at the same time emulate scrubbing or sweeping motions used in cleaning. The prospective visitors are thus engaged in dancing together as another form of everyday exercise in a familiar environment, during an everyday task.

None of the eight final exhibits in PULSE inquire directly about prospective visitors' everyday health practices. Rather, knowledge, values and practices related to the human body are suggested in a diversity of ways using everyday situations and events. All exhibit texts use positive language rather than dictating the non-negotiable health behaviour recommended by traditional, authoritative health research. The focus on the family as a collective allows for a multitude of voices and opinions on health to be heard. Accordingly, we find the PULSE exhibition to fully embody the ideas of progressive health promotion, i.e. a dialogic discourse with socially-oriented, contextualised, equity-based approaches (Carlsson *et al.* 2009).

DISCUSSION

The pre-existing institutional logic of the science centre played an important role in the exhibition development process, substantially co-determining the transformation of health-related knowledge, values and practices in the development of the exhibition PULSE Plaza. Both authoritative and dialogic discourses were present in the scholarly knowledge,

values and practices that formed the basis of the PULSE project, as represented by traditional, authoritative biomedical research and operationalised in the KRAM framework (Eriksen *et al.* 2011), and progressive health promotion theory from the social sciences and humanities (Halkier & I. Jensen 2011), respectively. It required internal reflection to embrace the dialogic and contextual approach and challenge these pre-existing institutional logics. To accomplish this, the interaction between exhibition designers and researchers and the extensive user involvement were indispensable.

In the development process, content from progressive health promotion research was at times "crowded out" by a traditional, authoritative perspective on health as communicated through risk factors and non-negotiable KRAM recommendations. We suggest this conflict may have been caused by an institutional entrenchment of the discovery pedagogy that is a default "way of doing" in many science centres. Although discovery pedagogy *prima facie* offers visitors opportunities to interact with scientific phenomena in various ways, discovery pedagogy often implies authoritative, canonical accounts of science (Quistgaard & Kahr-Højland 2010). This means that attempts to introduce more dialogic and contextual approaches to science among science centre professionals can be met with considerable resistance. Indeed, in some cases, science centre professionals may be so strongly allied to the scientific research community that it is difficult for them to see the need for creating open and negotiable science experiences (Achiam & Holmegaard 2018).

However, in the development of PULSE Plaza, a gradual shift towards a more dialogic approach did eventually occur. This shift

148 required considerable reflection internally in the exhibition team, intense collaboration between researchers and designers, and a comprehensive user-involvement process to change the authoritative “way of doing”. In particular, the user involvement process seemed to create the conditions for reflection on exhibiting health using a dialogic discourse. The process was at times difficult, and required negotiations of roles and re-distribution of expertise and participation (Bønnelycke *et al.* 2018a). However, the benefits of employing a dialogic approach are difficult to overestimate: Not only does it reposition visitors as active participants rather than passive subjects to whom knowledge is to be transmitted (Bray *et al.* 2012), but it also represents a stepping stone in the science centre’s quest for external relevance by propelling it towards being a participatory museum (Simon 2010). We thus suggest that the most important implication of the present study is as an encouragement to science centre professionals to reflect on exhibition practices and investigate *if, where, and how* a more dialogic approach could be beneficial. Where, in science centre practices, can we be engaging rather than transmitting?

A dialogic approach to exhibition design is not, however, a fix-all solution. As Scott *et al.* (2006) argue, dialogic discourse cannot stand alone in the science education classroom, but should be balanced with elements of facilitated and authoritative discourse. We suggest the same balanced approach to science centre exhibition design. Indeed, the investigations carried out by Falk and Dierking (2013) of museum visitors’ identity-related motivations suggest that science centre visitors might prefer a traditional, authoritative exhibition one day, but yearn to be engaged in negotiating science another day. A mixed exhibition space that balances areas of traditional,

authoritative science centre exhibits with areas for negotiating science through dialogue is an interesting notion for further investigation.

CONCLUSION

Even though science centres offer a wide range of resources and opportunities for creating dialogic exhibitions that engage visitors in creating relevant and meaningful experiences with science, their authoritative pedagogical tradition poses challenges to such design ventures. In addition, visitors habitually expect to encounter exhibits that communicate scientific facts. Institutions must therefore be cautious of alienating visitors in their attempt to engage them. Given these hazards, the choice of an everyday scenario in the PULSE Plaza was risky, because it blurred the distinction between science centre experiences and everyday life. On the other hand, the whimsical twists and promotion of team spirit proposed by the dialogic and negotiable exhibition design can conceivably enable the visitors to build bridges between scientific knowledge and everyday life. We thus conclude that deliberate choices of theoretical framing and methods – in this case health promotion and a user-involvement strategy – can offer new opportunities for innovative science centre exhibition design.

NOTES

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1. KRAM: Kost, Rygning, Alkohol, Motion.
In English: nutrition, smoking, alcohol consumption, physical activity.

2. PULSE is not an acronym, but a proper noun. "Pulse is rhythm, a beat of the heart, a movement. [...] The name PULSE reflects the exhibition's goals of learning, fun and improving health" (Experimenterium and Steno Diabetes Centres 2012:1).
3. SOL is an acronym for the Danish terms "sundhed og lokalsamfund", in English "health and local community".
4. Our translation of the exhibition team's adaptation of the Danish nursery rhyme "Okker-Gokker Gum-miklokker" into "Okker-Gokker PULS for Pokker"

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